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ABSTRACT

Aptitude test scores have been correlated with grades in twenty-six courses and with overall indices of academic performance, based on over 500 students attending a public high school. There is little evidence of differential validity for the major academic subject areas; instead, five tests (English Vocabulary, Graphoria, Silograms, Analytical Reasoning, and Ideaphoria) tend to be most highly correlated with grades, and the latter four of these tests remain relatively highly correlated with grades after Vocabulary is controlled through partial correlation. Other aptitude tests correlate highly with some of the more specialized courses. (Author)

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CORRELATIONS OF APTITUDE TESTS WITH HIGH SCHOOL GRADES

by
Mark Daniel

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JOHNSON O'CONNOR RESEARCH FOUNDATION
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CONTENTS

Page

Abstract 1

Introduction 1

Sample and Procedures 3

Results 4
- Overall Performance 4
- Mathematics Courses 14
- English 14
- Social Studies 14
- Economics 15
- Natural Sciences 15
- Foreign Languages 15
- Music 15
- Other Courses 16

Conclusion 16

References 18

LIST OF TABLES

Page

1. Aptitudes Measured 2

2. Descriptions of Courses 5

3. Correlations of Aptitude Tests with Course Grades 7

Correlations of Aptitude Tests with High School Grades

by Mark Daniel

Abstract: Aptitude test scores have been correlated with grades in twenty-six courses and with overall indices of academic performance, based on over 500 students attending a public high school. There is little evidence of differential validity for the major academic subject areas; instead, five tests (English Vocabulary, Graphoria, Silograms, Analytical Reasoning, and Ideaphoria) tend to be most highly correlated with grades, and the latter four of these tests remain relatively highly correlated with grades after Vocabulary is controlled through partial correlation. Other aptitude tests correlate highly with some of the more specialized courses.

Introduction

Over the past several years the Johnson O'Connor Research Foundation has had the opportunity to administer its battery of aptitude and vocabulary tests to a large number of students at a public high school in New York City. This testing, as well as similar testing at other schools and colleges around the country, has been made possible by a generous grant from a private foundation. The purpose of the grant support has been to provide aptitude testing free of charge to students who can use the information in planning their careers. At the same time, the schools provide to the O'Connor Foundation information on the students' course grades and scores on college entrance examinations, to be used in validating the aptitude tests.

The present report is an analysis of the correlations of individual tests with grades in a variety of academic subjects. A previous report (Daniel, 1982a) investigated the tests' correlations with mathematics grades, based on a smaller sample. This report extends the analysis to the full range of high school courses.

The aptitude tests used in this study have been developed over a period of sixty years by the Johnson O'Connor Research Foundation. They measure a wide range of aptitudes in the areas of spatial ability, reasoning, memory, dexterity, musical ability, perceptual speed, and idea fluency. In addition, the test battery includes a measure of English vocabulary, which is considered to be knowledge rather than an unlearned aptitude. Table 1 lists and describes the aptitudes measured. The tests have reasonably high reliability (the median internal-consistency reliability coefficient is .87), and they have been utilized in numerous occupational and educational validation studies.

Table 1
Aptitudes Measured

Name	Description
Graphoria	Number-checking or clerical speed; speed of comparing pairs of numbers to see whether they are the same or different.
Ideaphoria	Verbal fluency, rate of flow of ideas.
Foresight	Keeping one's mind on a distant goal, taking a far-sighted viewpoint.
Inductive Reasoning	Quickness in seeing a relationship among separate facts, ideas or observations.
Analytical Reasoning	Arranging ideas into a logical sequence.
Structural Visualization	Visualizing an object in three dimensions, imagining how a solid object will look when taken apart or viewed from a different angle. This aptitude is measured by Wiggly Block, a timed assembly test.
Tonal Memory	Remembering a sequence of tones.
Pitch Discrimination	Distinguishing between tones very close to each other in pitch.
Rhythm Memory	Remembering a complex rhythm pattern.
Personality	When dealing with people, tending to react from a general, objective viewpoint vs. reacting from a personal, subjective viewpoint.
Memory for Design	Memory for straight-line patterns.
Observation	Memory for fine visual details.
Number Memory	Remembering several six-digit numbers simultaneously.
Silograms	Remembering paired nonsense and English words.
Finger Dexterity	Speed and accuracy in manipulating small objects with the fingertips.
Tweezer Dexterity	Speed and accuracy in handling small objects with tweezers.
English Vocabulary	Knowledge of general English vocabulary.

Sample and Procedures

A total of 583 students (220 males and 363 females) are included in the study. All were between the ages of 15 and 17 when they took the O'Connor test battery. With the students' permission, the school provided grade transcripts for all these students in the summer of 1982. This public high school specializes in communication arts, but includes the full high school curriculum.

Data for males and females have been treated separately because there are sex differences on a number of the aptitude tests. Analyses have been performed for courses which were taken by 50 or more students of one sex. Twenty-six courses meet this requirement. In addition, two overall indices have been used as criteria: rank in class, and the "college admissions average" (CAA). Class rank is based on all courses except Physical Education. The CAA is based only on five basic academic areas (English, social studies, mathematics, science, and foreign language). Course grades are given on a four-point scale: excellent (3), good (2), satisfactory (1), and no credit (0). In addition, the school allows students to take courses as independent study, and assigns four points upon successful completion. Because the independent-study courses are no more rigorous than the standard courses, for purposes of this research all four-point course credits have been converted to three points.

The basic question addressed by this research is: what aptitudes contribute to performance in specific courses and in overall high school performance? The answers to this question may help in counseling students regarding their choice of college major, or in identifying the source of problems that students may be having with schoolwork.

In order to answer this question, it is desirable to control for the influence of English vocabulary knowledge. Vocabulary is generally found to correlate substantially with academic performance (Bowker, 1981). Vocabulary also correlates moderately with several of the O'Connor aptitude tests (Daniel, 1983). Because a person's vocabulary score is thought to indicate knowledge more than inherent aptitude, controlling vocabulary through partial correlation helps in interpreting the influence of other aptitudes on course grades. In this report, correlations are reported both with and without partialling out vocabulary.

The desirability of controlling for age differences in the sample has been explored in detail. Such control would normally be called for because performance on many aptitude tests (and vocabulary) tends to improve between the ages of 15 and 17. However, there's a feature of this sample that makes such control difficult. During the period of

several years in which students from this school were tested, the school changed the way in which students were selected for testing. Initially, younger and more able students were eligible for the program. Later, as the funding for testing decreased, the school began selecting only older students (juniors and seniors) and also began to give preference to those who were having school difficulties. Presumably as a result of these changes, age tends to be slightly negatively correlated with raw test scores and grades.

One method of dealing with this complex situation would be to create a "time of testing" variable and partial both it and age out of the correlations between test scores and course grades. Application of this procedure results in virtually no change from the raw (unpartialled) correlations. In light of these facts, it has been thought best to leave age and time of testing uncontrolled.

A word is needed regarding the two indicators of overall academic performance, rank in class and CAA. Between 1980 and 1981 the school changed its method of calculating the CAA. Because more cases were available for this pre-1981 period, these cases were used in the analysis. In computing the CAA, independent study courses were given four points credit. Rank in class was not available for all students, but the reason for this is not known.

Results

Brief descriptions of the 26 courses analyzed are given in Table 2. The correlations between raw aptitude test scores and course grades are shown in Table 3. Sample sizes for the various correlations with a given course vary slightly because some examinees do not have scores on all the aptitude tests. The partial correlations (controlling for English vocabulary) are based on the set of cases having complete aptitude test data.

Overall performance

Overall academic performance, as indexed by the CAA and rank in class, correlates highest with the following tests: English Vocabulary, Analytical Reasoning, Silograms, Ideaphoria, Graphoria, and Memory for Design. Although Vocabulary is the single best predictor for females, for males its correlations are exceeded by those of Graphoria, Analytical Reasoning, and Ideaphoria. Three of the tests listed above (Analytical Reasoning, Ideaphoria, and Silograms) use verbal material and correlate moderately highly with vocabulary. Thus, we might expect the correlations for these tests to drop substantially when vocabulary is controlled. Graphoria tends to have the highest partial correlations with overall performance, accounting for about 10 percent of the variance that remains after the effects of vocabulary are removed.

Table 2
Descriptions of Courses

Course Name	Description
Algebra	9th-year mathematics dealing with sets, the real number system, the solution of equations and inequalities, graphs, etc.
Geometry	Euclidean geometry for students who have completed algebra.
Junior Math	Algebra/trigonometry
Writers Workshop	Basic skills and techniques of writing.
Write On!	Continuation of basic skills and techniques of writing.
The Americans	Immigration patterns, problems of adjustment and contribution of religions of religious, ethnic and racial minorities in America.
American Government	National government with special emphasis on the structure, operations and functions of the President, Congress, and the Judiciary.
War in the 20th Century	Causes and consequences of World Wars I and II and the rise of Nazism in Germany.
The Isms	The role of industrialization, nationalism and imperialism on 18th and 19th century Europe.
American Diplomatic History	Foreign policy in the United States from the time of independence to its rise as a world power.
The Jazz Age	Changes in the field of communications and their effects on society in the twenties.
Economics	Nature of economics and the functions of the market system in the United States.
Intro to Biology	Nature of life with emphasis on the cell as the basic structure of living things.
Homeostasis	Nature of life with emphasis on the obtaining and processing of essential substances.
Physics	Principles of momentum, heat, magnetism, light and electricity.
Chemistry	Structure of matter, physical and chemical changes, radioactivity and organic chemistry.

Table 2 (cont.)
Descriptions of Courses

Course Name	Description
Plant Parenthood	Study of plant growth by using "hand-ons" experiences in a greenhouse.
Reproduction and Development	Analysis of reproduction in various living things.
Spanish I	Fundamentals of structure, pronunciation, vocabulary, and culture of language.
Spanish II	Reading comprehension, conversation, and the development of the writing skill.
French II	Reading comprehension, conversation, and the development of the writing skill.
Piano	Fundamentals of piano technique.
Guitar	Fundamentals of guitar technique.
Accounting	Fundamental theory of recording changes in the assets, liabilities, and capital of a business; and introduction to the special journals used.
Typing	Development of typing skills and the proper preparation of term papers, invoices, stencils, etc.
Photo	Black-and-white film developing and contact printing.

Table 3

Correlations of Aptitude Tests with Course Grades

Test	CAA				RANK IN CLASS			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.45	.27	.30	.31	.39	.24	.35	.28
Ideaphoria	.35	.33	.26	.31	.35	.27	.26	.24
Foresight	.04	.03	-.04	-.07	.08	.03	.00	-.05
Inductive Reasoning	.14	.19	.14	.09	.14	.17	.13	.09
Analytical Reasoning	.44	.34	.37	.17	.34	.32	.24	.17
Wiggly Block	.09	-.04	.04	-.08	.15	.00	.11	-.04
Personality	.05	.13	-.06	.06	.07	.13	.04	.07
Tonal Memory	.29	.09	.16	.04	.27	.09	.17	.07
Pitch Discrimination	.04	.23	-.07	.17	.12	.18	.06	.10
Rhythm Memory	.31	.07	.23	.07	.25	.10	.19	.07
Memory for Design	.28	.20	.26	.15	.31	.24	.27	.20
Silograms	.41	.37	.38	.24	.27	.30	.22	.18
Number Memory	.20	.06	.15	.04	.28	.08	.24	.07
Observation	.19	.05	.19	.07	.20	.07	.19	.09
Finger Dexterity - R	.05	.12	-.09	.19	.11	.07	.02	.12
Tweezer Dexterity	.22	.18	.19	.24	.17	.15	.12	.22
English Vocabulary	.31	.41	---	---	.28	.42	---	---
N	77-80	165-168	74	158	135-138	247-251	132	236

Test	ALGEBRA				GEOMETRY			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.27	.24	.19	.24	.31	.17	.30	.17
Ideaphoria	.25	.11	.14	.04	.33	.23	.27	.19
Foresight	.05	-.11	-.04	-.18	.08	.00	.02	-.06
Inductive Reasoning	.19	.06	.09	.01	.16	.08	.12	.02
Analytical Reasoning	.35	.19	.22	.06	.32	.29	.23	.18
Wiggly Block	.13	.06	.08	.03	.18	.02	.11	.00
Personality	.01	.23	.03	.20	.03	.09	.03	.03
Tonal Memory	.14	.11	.09	.07	.11	.09	.06	.07
Pitch Discrimination	.12	.02	.06	-.01	.11	.16	.07	.11
Rhythm Memory	.18	.12	.12	.09	.15	.15	.11	.11
Memory for Design	.37	.30	.30	.25	.23	.26	.13	.23
Silograms	.33	.30	.21	.24	.24	.17	.18	.07
Number Memory	.21	.24	.16	.23	.15	.07	.14	.07
Observation	.33	.12	.31	.08	.19	.03	.16	.01
Finger Dexterity - R	.12	.18	.05	.21	.12	.10	.07	.11
Tweezer Dexterity	.11	.09	.06	.12	.21	.12	.18	.15
English Vocabulary	.34	.27	---	---	.21	.29	---	---
N	130-138	212-225	129	202	185-192	307-318	181	296

[a] Partialling English Vocabulary.

Table 3 (cont.)
Correlations of Aptitude Tests with Course Grades

Test	JUNIOR MATH				WRITERS WORKSHOP			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.34	.23	.32	.25	.37	.13	.23	.13
Ideaphoria	.26	.20	.22	.16	.26	.21	.16	.19
Foresight	.05	-.01	.03	-.03	.16	.13	.08	.09
Inductive Reasoning	.04	.11	-.01	.05	.19	.13	.13	.06
Analytical Reasoning	.12	.20	.07	.09	.32	.26	.19	.12
Wiggly Block	.18	-.02	.14	-.04	.07	-.05	-.03	-.10
Personality	.05	.09	.04	.09	.09	.15	.08	.07
Tonal Memory	.07	.09	.03	.01	.14	.11	.07	.07
Pitch Discrimination	-.03	.11	-.05	.06	.07	.14	-.02	.08
Rhythm Memory	.03	.10	.03	.07	.05	.11	-.09	.10
Memory for Design	.17	.19	.15	.11	.12	.17	.04	.10
Silograms	.28	.20	.30	.16	.30	.17	.16	.07
Number Memory	.23	.06	.26	.11	.17	.10	.19	.03
Observation	.15	.08	.16	.07	.09	.03	.02	.02
Finger Dexterity - R	-.07	.07	-.06	.11	.17	.05	.05	.06
Tweezer Dexterity	-.09	.06	-.10	.14	-.01	.06	-.06	.10
English Vocabulary	.13	.28	---	---	.40	.34	---	---
N	134-137	226-232	133	168	138-145	248-257	132	238

Test	WRITE ON!				THE AMERICANS			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.24	.21	.15	.18	.41	.13	.33	.11
Ideaphoria	.36	.21	.25	.17	.37	.25	.22	.24
Foresight	.13	.07	.09	.03	.17	.08	.06	.01
Inductive Reasoning	.20	.02	.17	-.11	.10	.23	-.04	.15
Analytical Reasoning	.24	.16	.08	.03	.29	.28	.06	.20
Wiggly Block	.11	.05	.00	.02	.08	-.01	.01	-.03
Personality	.17	.10	.11	-.02	-.04	.01	-.02	-.02
Tonal Memory	.14	.05	.08	.00	.10	.11	-.04	.11
Pitch Discrimination	.20	.06	.13	-.02	-.03	.13	-.09	.15
Rhythm Memory	.26	-.03	.14	-.05	.10	.12	-.04	.11
Memory for Design	.26	.13	.14	.04	.23	.19	.08	.21
Silograms	.33	.27	.25	.19	.35	.29	.20	.18
Number Memory	.13	.14	.08	.09	.14	-.03	.09	.01
Observation	.22	.03	.17	.03	.15	-.03	.09	-.01
Finger Dexterity - R	.23	.10	.16	.10	.11	.05	.06	.09
Tweezer Dexterity	.13	.06	.09	.10	.13	.08	.08	.11
English Vocabulary	.40	.33	---	---	.41	.36	---	---
N	116-120	205-212	113	197	104-114	213-224	98	202

[a] Partialling English Vocabulary.

Table 3 (cont.)
Correlations of Aptitude Tests with Course Grades

Test	AMERICAN GOVERNMENT				WAR IN THE 20TH CENTURY			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.35	.17	.24	.18	.38	.17	.29	.14
Ideaphoria	.42	.27	.27	.23	.37	.25	.25	.19
Foresight	.07	.10	-.13	.06	.12	.19	.03	.12
Inductive Reasoning	.07	.10	-.06	.01	.20	.18	.10	.08
Analytical Reasoning	.34	.27	.14	.15	.33	.32	.09	.13
Wiggly Block	.01	-.02	-.06	-.04	.07	.03	.01	-.01
Personality	.07	.11	.03	.07	.09	.10	.02	.03
Tonal Memory	.07	.09	-.08	.11	.20	.14	.10	.11
Pitch Discrimination	.10	.05	-.01	.02	.20	.15	.09	.09
Rhythm Memory	.08	.07	-.05	.04	.22	.12	.08	.07
Memory for Design	.23	.14	.11	.10	.31	.22	.22	.17
Silograms	.25	.24	.09	.12	.35	.28	.14	.12
Number Memory	.17	.00	.15	.01	.19	.11	.12	.08
Observation	.17	-.01	.13	.01	.21	-.01	.14	-.02
Finger Dexterity - R	.18	-.02	.10	.02	.15	.08	-.03	.08
Tweezer Dexterity	.09	.03	.02	.06	.09	.02	.00	.07
English Vocabulary	.47	.39	---	---	.52	.46	---	---
N	176-183	302-317	170	290	162-169	225-243	157	226

Test	THE ISMS				AMER. DIPLOMATIC HISTORY			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.29	.13	.20	.13	.36	.11	.27	.12
Ideaphoria	.39	.17	.24	.16	.34	.22	.24	.17
Foresight	.24	.12	.16	.04	.12	.14	-.01	.09
Inductive Reasoning	.05	.17	-.03	.11	.06	.21	.00	.16
Analytical Reasoning	.28	.25	.13	.11	.29	.28	.14	.15
Wiggly Block	.09	.02	-.01	.01	.08	.05	.05	-.06
Personality	.19	.27	.20	.25	.12	.10	.08	.07
Tonal Memory	.10	.01	.07	-.03	.06	.07	-.04	.08
Pitch Discrimination	-.01	-.08	-.10	-.18	.09	.05	.01	.03
Rhythm Memory	.10	.02	.06	-.03	.14	.06	.02	.03
Memory for Design	.16	.16	.00	.07	.21	.11	.15	.05
Silograms	.48	.14	.34	.05	.13	.25	.00	.17
Number Memory	.19	.12	.14	.08	.11	.05	.07	.06
Observatiion	.14	.14	.03	.11	.14	.01	.10	.02
Finger Dexterity - R	.04	.05	-.09	.04	.15	-.03	.09	.00
Tweezer Dexterity	.07	.10	.09	.01	.11	.08	.07	.10
English Vocabulary	.49	.33	---	---	.38	.38	---	---
N	86-93	119-125	85	118	166-172	296-311	160	284

[a] Partialling English Vocabulary.

Table 3 (cont.)
Correlations of Aptitude Tests with Course Grades

Test	THE JAZZ AGE				ECONOMICS			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.40	.06	.30	.10	.24	.16	.19	.18
Ideaphoria	.39	.19	.27	.13	.28	.31	.20	.28
Foresight	.20	.02	.13	.00	.12	.05	.04	-.02
Inductive Reasoning	.13	.22	.03	.14	.08	.15	.05	.09
Analytical Reasoning	.26	.21	.03	.04	.32	.27	.21	.14
Wiggly Block	.09	-.04	.06	-.05	.11	-.05	.09	-.06
Personality	-.10	.10	-.09	-.01	-.01	.16	-.07	.15
Tonal Memory	.14	.15	.13	.11	.21	.05	.11	.03
Pitch Discrimination	.07	.13	-.06	.05	.10	.09	.06	.04
Rhythm Memory	.14	.10	.00	.07	.25	.12	.18	.09
Memory for Design	.20	.29	.10	.10	.18	.17	.12	.13
Silograms	.24	.22	.04	.13	.22	.20	.14	.10
Number Memory	.00	.02	.01	.01	.04	.05	-.02	.06
Observation	.08	-.04	.00	-.08	.12	.00	.11	.02
Finger Dexterity - R	.10	.04	.07	.01	.14	.05	.07	.10
Tweezer Dexterity	-.05	-.03	-.11	.02	.18	.10	.13	.14
English Vocabulary	.50	.36	---	---	.27	.39	---	---
N	101-108	190-197	98	184	176-183	305-318	172	294

Test	INTRO TO BIOLOGY				HOMEOSTASIS			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.26	.08	.16	.07	.23	.11	.18	.10
Ideaphoria	.33	.19	.22	.14	.29	.20	.20	.16
Foresight	.17	.08	.08	-.02	.02	.02	-.06	-.06
Inductive Reasoning	.09	.15	.02	.07	.02	.20	-.01	.11
Analytical Reasoning	.39	.26	.24	.13	.23	.25	.14	.11
Wiggly Block	.16	.01	.13	.00	.01	-.03	-.08	-.05
Personality	.06	.20	.04	.18	.02	.08	-.01	.04
Tonal Memory	.25	.10	.19	.07	.14	.12	.07	.09
Pitch Discrimination	.16	.16	.09	.12	.17	.12	.02	.09
Rhythm Memory	.19	.11	.13	.09	.06	.09	.02	.05
Memory for Design	.26	.16	.17	.13	.17	.20	.08	.16
Silograms	.28	.20	.09	.11	.20	.25	.15	.15
Number Memory	.13	.07	.06	.07	.19	.09	.15	.11
Observation	.13	.10	.07	.13	.12	.08	.10	.06
Finger Dexterity - R	.11	.06	.04	.07	.06	.08	.01	.10
Tweezer Dexterity	.16	.10	.13	.11	.04	.15	.00	.18
English Vocabulary	.41	.34	---	---	.29	.34	---	---
N	183-189	326-341	177	314	155-158	281-293	151	272

[a] Partialling English Vocabulary.

Table 3 (cont.)
Correlations of Aptitude Tests with Course Grades

Test	PHYSICS				CHEMISTRY			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.40	.04	.39	.08	.44	.26	.43	.25
Ideaphoria	.20	.24	.20	24	.15	.24	.14	.25
Foresight	.11	.24	.09	.18	.12	.18	.08	.19
Inductive Reasoning	.05	-.08	.03	-.21	.16	-.09	.12	-.17
Analytical Reasoning	.25	.31	.22	.21	.25	.30	.19	.22
Wiggly Block	.20	-.05	.19	-.01	.26	-.03	.27	-.02
Personality	.21	-.11	.23	-.15	.28	.02	.31	-.05
Tonal Memory	.00	.30	-.01	.29	.09	.19	.06	.19
Pitch Discrimination	-.09	.20	-.10	.16	-.05	.15	-.07	.05
Rhythm Memory	.07	.16	.07	.13	-.04	.15	-.04	.14
Memory for Design	.30	.30	.30	.38	.19	.20	.20	.24
Silograms	.28	.13	.26	.12	.13	.24	.07	.28
Number Memory	.29	.12	.28	.16	.21	.12	.19	.15
Observation	.03	.22	.03	.35	.06	.04	.05	.11
Finger Dexterity - R	.02	-.01	.01	.05	-.07	.07	-.10	.04
Tweezer Dexterity	.03	.14	-.01	.20	.07	.04	.00	.08
English Vocabulary	.14	.30	---	---	.23	.20	---	---
N	70	56-58	70	54	68	64-66	68	61

Test	PLANT PARENTHOOD				REPRO. & DEVELOP.			
			Partial r^a				Partial r^a	
	M	F	M	F	M	F	M	F
Graphoria	.11	.03	-.01	.01	.25	.06	.18	.06
Ideaphoria	.25	.19	.09	.09	.38	.25	.29	.22
Foresight	.12	.07	.01	.01	.16	.09	.08	.01
Inductive Reasoning	.19	.25	.07	.17	.02	.14	-.02	.06
Analytical Reasoning	.46	.28	.34	.13	.27	.30	.21	.16
Wiggly Block	.25	-.01	.14	-.01	-.01	-.02	-.07	-.03
Personality	.13	.21	.17	.17	.18	.09	.16	.05
Tonal Memory	.00	.10	-.07	.07	.12	.15	.05	.13
Pitch Discrimination	.06	.11	-.05	.03	.07	.16	.03	.10
Rhythm Memory	.05	.16	-.06	.15	.14	.10	.11	.05
Memory for Design	.45	.29	.33	.22	.29	.20	.25	.18
Silograms	.31	.21	.24	.12	.20	.24	.13	.15
Number Memory	.09	.15	.10	.16	.15	.04	.09	.04
Observation	.28	.12	.23	.12	.22	.04	.23	.03
Finger Dexterity - R	.23	.11	.13	.14	.07	.02	.03	.06
Tweezer Dexterity	.14	.04	.04	.09	.09	.15	.07	.18
English Vocabulary	.40	.28	---	---	.30	.39	---	---
N	66-72	172-182	65	165	153-156	278-291	149	270

[a] Partialling English Vocabulary.

Table 3 (cont.)
Correlations of Aptitude Tests with Course Grades

Test	SPANISH I				SPANISH II			
			Partial r[a]				Partial r[a]	
	M	F	M	F	M	F	M	F
Graphoria	.37	.27	.33	.25	.39	.28	.39	.24
Ideaphoria	.09	.23	.03	.16	.18	.21	.16	.15
Foresight	.04	.07	-.03	.05	.00	-.05	.00	-.09
Inductive Reasoning	.13	.14	.09	.07	.06	.07	.07	-.04
Analytical Reasoning	.29	.24	.26	.17	.19	.22	.20	.10
Wiggly Block	-.05	.17	-.04	.15	.00	-.08	-.02	-.11
Personality	.08	.16	.08	.12	.11	.08	.12	.05
Tonal Memory	.21	-.04	.26	-.04	.01	.00	.02	-.02
Pitch Discrimination	.03	-.03	.06	-.05	-.05	.00	-.06	-.05
Rhythm Memory	.15	.06	.17	.02	.02	.00	.02	-.08
Memory for Design	.23	.21	.25	.14	.06	.17	.05	.02
Silograms	.37	.29	.34	.21	.34	.31	.34	.14
Number Memory	.17	.19	.14	.22	.22	.05	.22	.03
Observation	.27	.16	.26	.12	.15	.03	.16	.01
Finger Dexterity - R	.00	.26	-.02	.27	-.03	.09	-.04	.09
Tweezer Dexterity	.09	.10	.08	.14	.05	.01	.08	.05
English Vocabulary	.07	.22	---	---	.08	.40	---	---
N	67-69	115-123	64	111	101-104	165-176	100	159

Test	FRENCH II				PIANO			
			Partial r[a]				Partial r[a]	
	M[b]	F	M[b]	F	M[b]	F	M[b]	F
Graphoria	---	.14	---	.13	---	.15	---	.12
Ideaphoria	---	.28	---	.25	---	.22	---	.19
Foresight	---	.13	---	.07	---	.03	---	.00
Inductive Reasoning	---	.02	---	-.10	---	.02	---	.00
Analytical Reasoning	---	.15	---	.02	---	.12	---	.08
Wiggly Block	---	-.15	---	-.24	---	.02	---	.03
Personality	---	.21	---	.19	---	-.06	---	-.04
Tonal Memory	---	.11	---	.03	---	.22	---	.22
Pitch Discrimination	---	.08	---	.07	---	.16	---	.16
Rhythm Memory	---	-.28	---	-.30	---	.15	---	.09
Memory for Design	---	-.34	---	-.33	---	.07	---	.02
Silograms	---	.09	---	.08	---	.12	---	.09
Number Memory	---	-.07	---	-.11	---	.04	---	.04
Observation	---	-.19	---	-.15	---	-.08	---	-.07
Finger Dexterity - R	---	-.15	---	-.09	---	.10	---	.10
Tweezer Dexterity	---	.11	---	.11	---	.20	---	.19
English Vocabulary	---	.17	---	---	---	.14	---	---
N		52-54		46		125-131		121

[a] Partialling English Vocabulary.
[b] Fewer than 50 cases.

Table 3 (cont.)
Correlations of Aptitude Tests with Course Grades

Test	GUITAR				ACCOUNTING			
			Partial r[a]				Partial r[a]	
	M	F	M	F	M[b]	F	M[b]	F
Graphoria	.40	.22	.36	.22	---	.10	---	.12
Ideaphoria	.35	.22	.28	.16	---	.10	---	.00
Foresight	.07	.12	.02	.10	---	-.08	---	-.17
Inductive Reasoning	.30	.29	.28	.27	---	.32	---	.24
Analytical Reasoning	.23	-.03	.17	-.10	---	.29	---	.19
Wiggly Block	.11	-.11	.10	-.08	---	.08	---	.07
Personality	.05	.11	.03	.07	---	.14	---	.11
Tonal Memory	.22	.10	.22	.09	---	.06	---	.01
Pitch Discrimination	.27	.11	.25	.05	---	.06	---	-.02
Rhythm Memory	.26	.10	.22	.06	---	.04	---	.01
Memory for Design	.26	.13	.23	.10	---	.19	---	.20
Silograms	.34	.09	.27	.05	---	.30	---	.22
Number Memory	.16	.05	.13	.05	---	.05	---	.06
Observation	.02	.20	-.04	.21	---	.12	---	.10
Finger Dexterity - R	.10	.14	.09	.09	---	.22	---	.18
Tweezer Dexterity	.31	.29	.28	.35	---	.13	---	.15
English Vocabulary	.15	.06	---	---	---	.31	---	---
N	82-84	104-111	80	102		95-99		94

Test	TYPING				PHOTO			
			Partial r[a]				Partial r[a]	
	M	F	M	F	M	F	M	F
Graphoria	.17	.24	.17	.23	.14	.12	.07	.10
Ideaphoria	.37	.15	.41	.09	.32	.17	.22	.16
Foresight	.10	.02	.02	-.04	.14	.08	.08	.07
Inductive Reasoning	.16	.11	.18	.05	.30	.15	.22	.12
Analytical Reasoning	.09	.18	-.07	.06	.43	.06	.36	.01
Wiggly Block	.06	.05	-.17	.04	.12	-.06	.03	-.10
Personality	.11	.10	.10	.06	-.02	.09	.03	.04
Tonal Memory	.13	.12	.13	.11	.20	-.06	.13	-.06
Pitch Discrimination	.14	.15	.14	.12	.18	-.06	.12	-.07
Rhythm Memory	.18	.07	.15	.05	.23	-.12	.19	-.14
Memory for Design	.12	.18	.01	.15	.34	.12	.25	.12
Silograms	.16	.19	.10	.10	.10	.05	.07	.02
Number Memory	.03	.08	-.03	.06	.07	.04	.04	.02
Observation	.20	.09	.19	.10	.12	.04	.07	.04
Finger Dexterity - R	-.02	.00	-.04	.01	.28	.17	.22	.16
Tweezer Dexterity	.15	.11	.07	.14	.23	.12	.17	.14
English Vocabulary	.15	.28	---	---	.27	.09	---	---
N	77-82	285-298	75	275	86-90	120-125	84	117

[a] Partialling English Vocabulary.
[b] Fewer than 50 cases.

However, the partial correlations of Silograms, Ideaphoria, and Analytical Reasoning remain relatively high, indicating that these tests measure abilities that are related to school performance even after their verbal component has been controlled.

Graphoria's relationship to academic work is easily explained: clerical speed and accuracy can be an asset in taking tests and in doing homework or other paper and pencil activities. The Analytical Reasoning test appears to measure the "logical reasoning" factor (Daniel, 1982b) that is used in deductive, step-by-step reasoning. This test was previously found to be a good predictor of mathematics grades (Daniel, 1982a). The Ideaphoria test is a measure of verbal fluency, perhaps (more specifically) fluency of writing. The ability to write one's thoughts rapidly and easily could be helpful in writing reports and answering essay-test questions. The relatively high correlations for Silograms and Memory for Design suggest that the ability to memorize information is important in schoolwork.

Mathematics Courses

English Vocabulary, Graphoria, Analytical Reasoning, Silograms, Memory for Design, and Ideaphoria tend to correlate highest with grades in the three mathematics courses. When Vocabulary is partialled, the correlation for Graphoria is virtually unchanged; the correlations for the other tests are reduced, but they remain relatively good predictors of grades. Analytical Reasoning does not correlate as highly with math grades in this study as it did in our earlier study based on smaller samples (Daniel, 1982a). It is noteworthy that structural visualization ability (measured by the Wiggly Block) is not correlated with grades in any of the math courses, after the influence of Vocabulary is controlled. In summary, math grades correlate with the same tests that predict overall academic performance.

English

English Vocabulary is clearly the best predictor of grades in the two English courses, followed by Silograms, Ideaphoria, Analytical Reasoning, and Graphoria. When Vocabulary is controlled, Ideaphoria, Graphoria, and Silograms correlate highest with grades.

Social Studies

English Vocabulary tends to correlate as highly or slightly higher with the six social studies courses as it did with the English courses. The other test correlations follow the same pattern as was seen with the English courses: Ideaphoria, Analytical Reasoning, and Silograms are good predictors. Graphoria correlates quite highly with social studies grades for males but not for females. When Vocabulary is partialled,

Ideaphoria continues to be fairly highly correlated with social studies grades, but the correlations for Analytical Reasoning and Silograms are substantially reduced (although these tests remain relatively good predictors). The partial correlations for Graphoria are, again, high for males but moderate for females.

Economics

There is one economics course, which was taken by a relatively large number of students. It is most highly correlated with Vocabulary, Ideaphoria, and Analytical Reasoning. After partialling Vocabulary, the best predictors are Ideaphoria, Analytical Reasoning, and Graphoria.

Natural Sciences

English Vocabulary is again the best predictor of grades in the six science courses. Other tests that correlate relatively highly are Analytical Reasoning, Ideaphoria, Memory for Design, and Silograms. Graphoria is not as strongly correlated with science grades as it had been with grades in some other subjects. When Vocabulary is partialled, the best predictors are Memory for Design, Analytical Reasoning, Ideaphoria, and Silograms. Memory for Design and Analytical Reasoning in particular are more highly related to science grades than to grades in mathematics, English or social studies. The Wiggly Block test correlates fairly highly (.20 to .26) with three of the science courses (Physics, Chemistry, and Plant Parenthood), but only for the male students; correlations for females are negative in all three courses, and in the other three courses correlations are low for both sexes.

Foreign Languages

The tests that correlate most highly with grades in Spanish and French are Silograms, Graphoria, Analytical Reasoning, Ideaphoria, and English Vocabulary. The first four of these tests continue to be good predictors when Vocabulary is controlled.

Music

A large number of students took courses in piano or guitar. Tweezer Dexterity is the best predictor of grades in these courses; Graphoria, Ideaphoria, and the music tests (especially Tonal Memory and Pitch Discrimination) are also relatively highly correlated with grades. English Vocabulary does not correlate highly with grades in these courses, and as a result, the partial correlations (controlling for Vocabulary) are not much different from the unpartialled correlations.

Other Courses

The tests most highly correlated with grades in Accounting are English Vocabulary, Inductive Reasoning, Silograms, Analytical Reasoning, and Finger Dexterity. The last four of these tests remain good predictors after Vocabulary is partialled. Interestingly, neither Graphoria nor Ideaphoria is related to performance in the Accounting course. The fact that these correlations are based only on female cases may have had some influence on the results (particularly the low Graphoria correlation).

Performance in the typing course is best predicted by English Vocabulary, Graphoria, and Ideaphoria. Only Graphoria is a good predictor after Vocabulary is partialled.

Five tests are fairly highly correlated with grades in the Photography course, both before and after controlling for vocabulary: Ideaphoria, Analytical Reasoning, Inductive Reasoning, Memory for Design, and Finger Dexterity.

Conclusion

With few exceptions, grades in any subject area are best predicted by five tests: English Vocabulary, Ideaphoria, Graphoria, Analytical Reasoning, and Silograms. Even when Vocabulary is controlled through partial correlation, the other tests in this set tend to be the most highly correlated with grades.

The exceptions to this pattern may be summarized as follows (grouped by test):

Memory for Design is relatively highly correlated with grades in mathematics, natural sciences, and photography as well as with the overall performance indices (CAA and rank).

Finger Dexterity correlates relatively highly with grades in accounting and photography.

Tweezer Dexterity, Tonal Memory, and Pitch Discrimination have relatively high correlations with grades in the two music courses (piano and guitar).

Inductive Reasoning correlates relatively highly with grades in photography.

In general, there is surprisingly little differential validity for different areas of coursework, especially among the basic academic areas

which are represented by several courses (math, science, English, social studies and foreign languages). What differentiation does exist occurs with the specialized, less academic courses, such as music, photography, typing, and accounting.

REFERENCES

All technical reports, statistical bulletins and test manuals mentioned in the reference list are published by the Johnson O'Connor Research Foundation, New York. Technical reports are available for sale to the general public. All test manuals and some statistical bulletins contain confidential information which prohibits their distribution to the public.

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